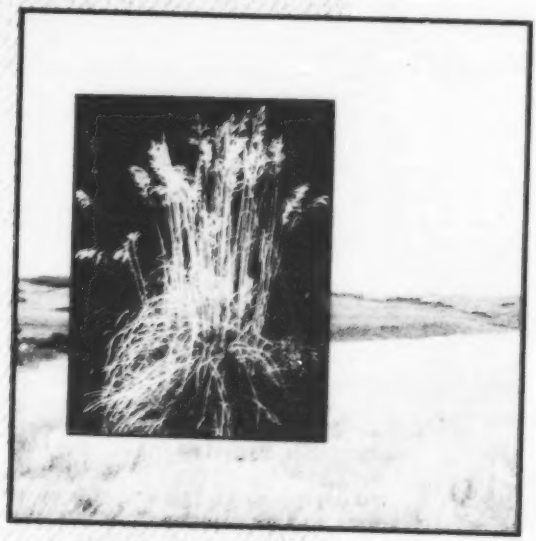
Saskatchewan
Agriculture
and Food



Forage crop recommendations

10 Steps to Successful Seeding

1. Careful preparation of land, equipment and seed is essential for successful forage seeding. Moisture is a critical factor: establishment failures can occur during dry periods even with excellent seeding techniques.

2. Seed shallowly - for most forages, roughly 1/2 - 1 inch (1-3 cm) deep.

3. Seed into a firm seedbed. Clean, unworked stubble land is excellent. Fallow land should be worked shallowly, followed by harrowing and packing prior to seeding. Drills should not penetrate deeper than 1 inch (3 cm).

4. Choose a seeding implement that can deliver low seeding rates without bridging or plugging, and one that has good depth control. Discers are generally not acceptable.

5. If necessary, use herbicides to control winter annual weeds (see publication, Chemical Weed Control in Cereal, Oilseed, Pulse and Forage Crops).

6. Use seeding rates on page 6. As a starting point, set drill to deliver 1 bu/acre on the wheat scale. Ideal rate is 20-30 seeds per foot of row. Check seeder by running over a hard surface and counting seed. (For calculating seeding rates, see page 16.)

7. Many grain drills are not designed to handle the low seeding rates required for forages. Overcome this by using a grass seeder attachment or by seeding through the fertilizer box. Small or light seed may be seeded more successfully by using coated seed or by using a carrier such as; a) up to 15 lb/ac of 11-55-0 fertilizer (do not use with inoculated legumes); b) cracked grain; or c) horticultural vermiculite. Agitation will be necessary.

8. Wide-spaced or alternate-row seeding can be done by taping or covering the drill openings not required, followed by (your choice): a) seeding legume through forage seed or fertilizer box and grass through the grain box after diluting as in step 7, or b) dividing drill box into compartments using cardboard dividers and tape.

9. Companion crops usually reduce subsequent yield of forage, depending on moisture availability. Low companion crop seeding rates (1/2 to 1/4 of normal) in cross-row or alternate-row seeding will minimize competition. Companion crops are best cut early for hay, leaving a tall (6-8 inch) stubble. Seeding companion crops with forage in the brown soils may reduce the chance of obtaining a good stand of forage.

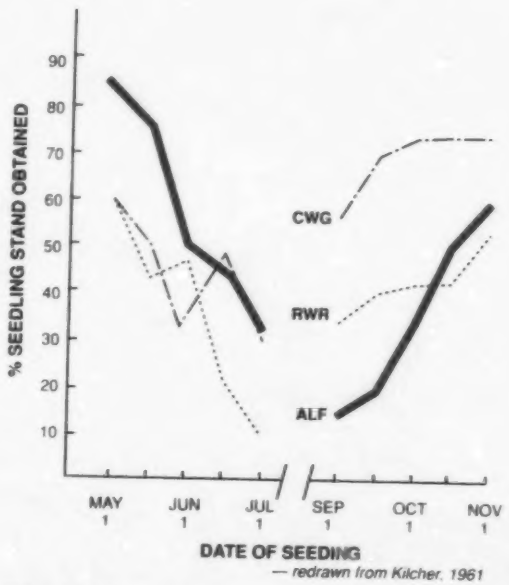
10. Be patient. Complete establishment may take two growing seasons.

Seeding Dates

Date of seeding is very critical with forages. The graph below shows the stands obtained from different seeding dates at Swift Current. Early spring (May 1) and late fall (Nov. 1) seeding gave the best establishment. Seeding at any time between June 1 and Oct. 1 gave poorer results. In moister areas, spring seeding may be delayed to obtain proper weed control.

If late fall seeding is chosen, seed as close to freeze-up as possible, so no germination occurs until spring. Some winter seed loss may occur; depending on the severity of conditions (exposed fields, spring flooding etc.) the recommended seeding rates on page 6 can be increased. Do not seed sweetclover in the fall as it may winterkill.

Effect of Seeding Date on Final Stands of Alfalfa, Crested Wheatgrass, and Russian Wild Ryegrass (Swift Current)



— redrawn from Kilcher, 1961

Abbreviations:
CWG - Crested Wheatgrass
RWR - Russian Wild Ryegrass
ALF - Alfalfa

Recommended Varieties of Perennial Grasses

Grass	Varieties	Soil Zones (see map, page 9)	Comments
Bromegrass	Signal	1,2,3, Irr.	North/South type: high seed yield
	Carlton	1,2,3, Irr.	Northern Type
	Magna	1,2,3, Irr.	Southern type with leaf spot resistance
	Baylor	1,2,3, Irr.	U.S. variety with satisfactory hay yield.
	Rebound	1,2,3, Irr.	Pasture type; Low seed yield
Crested Wheatgrass	Kirk	1,2,3	Tall, high yielding hay type
	Fairway	2,3, Irr.	Used mainly for roadside seeding
	Parkway	2,3, Irr.	5% higher yield than Fairway
	Nordan	1,2	Does not persist in zone 3, Irr.
	Summit	1,2	Does not persist in zone 3, Irr.
Russian Wild Ryegrass	Tetracan	1,2,3	Large seeded variety
	Swift	1,2,3	Has most seeding vigor
	Mayak	1,2,3	Good seed & forage yield
	Cabree*	1,2,3	Resistant to seed shattering
Intermediate Wheatgrass	Chief	1,2,3, Irr.	Higher yield than Greenleaf
	Clarke	1,2,3, Irr.	More drought tolerance & higher seed yield than Chief
	Greenleaf	1,2,3, Irr.	Does well in moist areas
Altai Wild Ryegrass	Prairieland	1,2,3	Saline tolerant; requires extra care in seeding year. Retains nutritive value in fall.
	Eejay**	1,2,3	Eejay and Pearl have improved seed production.
	Pearl**	1,2,3	
Dahurian Wild Ryegrass	James	1,2,3	Quick to establish and short-lived.
	Arthur	1,2,3	
Slender Wheatgrass	Revenue	1,2,3	Quick to establish and saline tolerant; short-lived.
Tall Wheatgrass	Orbit	1,2,3	Saline tolerant; may become coarse
Meadow Bromegrass	Fleet	3, Irr.	More rapid regrowth than smooth bromegrass; good for pastures.
	Paddock	3, Irr.	
	Regar	3, Irr.	
Reed Canarygrass	Castor*	1,2,3	Flood tolerant; high alkaloid
	Vantage	1,2,3	Flood tolerant; Low alkaloid
	Venture	1,2,3	Flood tolerant; Low alkaloid
	Rival	1,2,3	Flood tolerant; Low alkaloid
Streambank Wheatgrass	Sodar	1,2,3	Yards, waterways, airstrips, etc.
Timothy	Climax, Champ, Basho	3	Grown mainly for seed production
Creeping Red Fescue	Boreal	3,Irr.	Grown mainly for seed production; also component of irrigated pasture mixtures.
Kentucky Bluegrass	Troy	Irr.	Component of irrigated pasture mixtures.
Orchardgrass	Kay	Irr.	Component of irrigated pasture mixtures; not completely winterhardy in southern Sask.

* Varieties that have been superseded for general use by new varieties and may be deleted in the future.
** Seed availability limited in 1990.

Recommended Varieties of Perennial Legumes

Legume	Varieties	Soil Zones	Comments
Alfalfa	Heinrichs	1,2,3	
	Drylander	1,2,3	
	Rambler	1,2,3	
	Rangelander	1,2,3	
	Roamer	1,2,3, Irr.	
	Beaver	2,3, Irr.	For more information,
	Anchor	2,3, Irr.	See Table, pg. 5
	OAC Minto	2,3, Irr.	
	Vernal	2,3, Irr.	
	Algonquin	3, Irr.	
	Alouette	3, Irr.	
	Apica	3, Irr.	
	Dekalb 120	3, Irr.	
	Barrier	Irr.	
	Pioneer 526	Irr.	
	Profit	Irr.	
Sweetclover	Norgold	1,2,3	Yellow flower, low coumarin
	Yukon*	1,2,3	Yellow flower, high coumarin
Red Clover	Altaswede	3	Grown for seed, forage & plowdown
	Norlac	3	Grown for seed, forage & plowdown
Alsike Clover	Aurora	3	Grown for seed, forage & plowdown
	Dawn	3	Grown for seed, forage & plowdown
Sainfoin	Melrose, Nova	2,3	Non-bloating; may be short-lived.
Birdsfoot Trefoil	Cree	3	Non-bloating & higher seed yield than Leo
	Leo	3	Non-bloating

* Varieties that have been superseded for general use by new varieties and may be deleted in the future.

For information on seed sources, consult the **Seed Guide**, Sask. Seed Growers' Association.

Grass - Legume Combinations

Generally, straight alfalfa will produce the highest yield of digestible nutrients of any perennial forage crop. However, grass-legume mixtures are very useful in pastures because of:

- less bloat potential in mixed pasture.
- more uniform supply of forage throughout the growing season.
- more uniform stand over entire pasture.
- productive life of pasture is extended.

Brome-alfalfa is a popular grass-legume mixture. However, in the higher rainfall areas of the Province, brome becomes very aggressive. To maintain a good grass-legume balance in these areas, recommended seeding rates on page 6 can be adjusted to increase the alfalfa and decrease the brome component.

Alfalfa Variety Characteristics

Variety	Rooting Patterns	Cold Tolerance or Persistence	Recovery After Cutting	Reaction to Bacterial Wilt	Use
Rambler	Creeping	Very good	Slow	Mod. Resistance	Hay or Pasture
Roamer	Creeping	Very good	Slow	Resistant	Hay or Pasture
Heinrichs	Creeping	Excellent	Slow	Resistant	Hay or Pasture
Drylander	Strongly Creeping	Very good	Slow	Resistant	Hay or Pasture
Rangelander	Very Strongly Creeping	Very good	Slow	Susceptible	Hay or Pasture
Beaver	Tap	Good	Medium	Resistant	Hay
Algonquin	Tap	Good	Medium	Resistant	Hay
Vernal	Tap	Medium	Medium	Resistant	Hay
Anchor	Tap	Medium	Rapid	Resistant	Hay
OAC Minto	Tap	Medium	Rapid	Resistant	Hay
Apica	Tap	Medium	Rapid	Resistant	Hay
Alouette	Tap	Medium	Rapid	Resistant	Hay
Dekalb 120	Tap	Medium	Medium	Resistant	Hay
Barrier*	Tap	Medium	Rapid	Resistant	Irr. Hay
Pioneer 526	Tap	Medium	Medium	Resistant	Irr. Hay
Profit*	Tap	Medium	Medium	Resistant	Irr. Hay

*Resistant to Verticillium Wilt

Alfalfa Cutting Management

Improper management of alfalfa hay stands can lead to winterkill. Understanding alfalfa physiology can help producers avoid this problem.

Carbohydrates are produced in alfalfa leaves and used to fuel plant growth. Excess carbohydrate is moved down to the thick underground crown of the alfalfa plant. This carbohydrate is used as stored fuel, for two purposes: shoot regrowth after cutting, and plant maintenance over winter.

When an alfalfa plant is cut for hay, few leaves remain and the plant must draw on stored carbohydrate for regrowth. As a rule of thumb, the plant will need six weeks to replace the leaves and to replenish stored reserves to pre-cutting levels.

Plants cut after August 15 may not have six weeks of good growing weather to replenish their reserves, and can go into the winter with nearly "empty tanks." If the winter is severe, death losses will result.

To reduce alfalfa winterkill:

- avoid cutting between Aug. 15 and first killing frost
- seed recommended, winterhardy varieties
- inoculate seed properly and maintain adequate soil P.
- manage stubble for maximum snowcover

Recommended Seeding Rates for Various Soil Zones

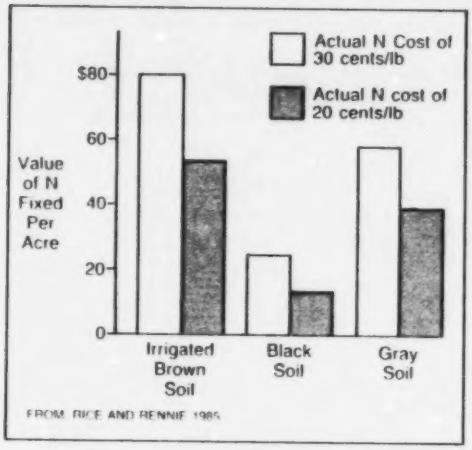
Soil Zone (see map on page 9)	Crops	Row Spacing Inches	Row Spacing Cm	Seeding Rate lb./acre or kg/ha
1. Brown	Hay Crops (seed grass and legume in alternate rows)			
	Crested wheatgrass & alfalfa	18-24	45-60	3 + 1
	Intermediate wheatgrass & alfalfa	18-24	45-60	4 + 1
	Alfalfa	18-24	45-60	4
	Sweetclover	6	15	8
	Pastures (cross-seed grass & legume)			
	Altai wild ryegrass & alfalfa	18-24	45-60	6 + 1
	Crested wheatgrass & alfalfa	18-24	45-60	2 + 1
	Russian wild ryegrass & alfalfa	18-24	45-60	3 + 1
	Intermediate wheatgrass & alfalfa	18-24	45-60	6 + 1
2. Dark Brown	Hay Crops (alternate rows)			
	Bromegrass & alfalfa	12-18	30-45	6 + 2
	Crested wheatgrass & alfalfa	12-18	30-45	5 + 2
	Intermediate wheatgrass & alfalfa	12-18	30-45	6 + 2
	Alfalfa	12-18	30-45	6
	Sweetclover	6	15	8
	Pastures (cross-seeded if possible)			
	Altai wild ryegrass & alfalfa	24	60	8 + 1
	Bromegrass & alfalfa	12-18	30-45	6 + 1
	Crested wheatgrass & alfalfa	24	60	4 + 1
	Intermediate wheatgrass & alfalfa	12-18	30-45	8 + 1
	Russian wild ryegrass & alfalfa	24	60	4 + 1
	Alfalfa (Caution - risk of bloat)	12-18	30-45	6
3. Black and Grey-wooded	Hay Crops			
	Bromegrass & alfalfa	12	30	8 + 2
	Crested wheatgrass & alfalfa	12	30	7 + 3
	Intermediate wheatgrass & alfalfa	12	30	11 + 3
	Alfalfa	12	30	6
	Sweetclover	6	15	8
	Pastures			
	Bromegrass & alfalfa	12	30	8 + 1
	Crested wheatgrass & alfalfa	12	30	7 + 2
	Intermediate wheatgrass & alfalfa	12	30	11 + 2
	Meadow bromegrass & alfalfa	12	30	8 + 1
	Meadow bromegrass	12	30	10
	Russian wild ryegrass	12	30	8
	Sainfoin (non-bloating)	12	30	30
	Birdsfoot trefoil (non-bloating)	6	15	4
Irrigation	Hay Crops			
	Bromegrass & alfalfa	6	15	8 + 3
	Intermediate wheatgrass & alfalfa	6	15	11 + 3
	Alfalfa	6	15	8
	Pastures			
	Meadow bromegrass & alfalfa	6	15	10 + 3
	Bromegrass & alfalfa	6	15	8 + 3
	Intermediate wheatgrass & alfalfa	6	15	11 + 3
	Kentucky bluegrass & alfalfa	6	15	2 + 3
	Meadow Bromegrass	6	15	10
	Orchardgrass	6	15	10

Notes: Other mixtures of the above species may be developed using information on page 16.
When seeding grass alone for pasture in the brown and dark-brown soil zones, increase grass recommended rate by 1.5 x.

Inoculation of Legumes

Inoculation is the addition of effective rhizobium bacteria to legume seed prior to planting. After germination, the bacteria form nodules on the roots and begin taking nitrogen gas from the soil air. They convert the gas to ammonium and give it to the plant. Well nodulated forage legumes can grow vigorously without the need for commercial nitrogen fertilizer.

Estimated annual value of N fixed by a pure alfalfa on three different soil types, using two N prices.



Many Saskatchewan soils lack the specific rhizobia needed for rapid growth and high yields of forage legumes. Inoculation corrects these deficiences by sticking thousands of highly effective N-fixing bacteria to each seed just before planting. The cost of inoculant is low and the potential yield benefits are substantial.

Each legume or group of legumes requires a unique species of **rhizobium** to form nodules and fix nitrogen. Commercial inoculants are prepared for specific legumes. Make sure you get the right one for your crop.

Methods of Inoculation

Inoculant is a dry powder that is mixed with the seed just prior to planting. In order to be effective, it must be "glued" to the seed, so a sticker solution is used to bind the two together. Sticking agents like diluted sugar water, molasses, soda pop, etc., are used, but research has shown that a solution of ordinary powdered skim milk is very effective.

Precise amounts of sticker are not important. Just mix the skim milk according to package directions (do not use hot water). Dribble (or spray) the milk onto the seed, wetting it thoroughly, and let the excess milk drain off. Turning the seed during this operation will ensure complete wetting.

Add inoculant to the wetted seed. Follow manufacturer's instructions for proper amounts. If you plan to broadcast seed, or if seeding conditions are not ideal, increase the amount. (Many growers routinely double the recommended rate of inoculant.) Stir the seed and inoculant thoroughly, then proceed with seeding as quickly as possible.

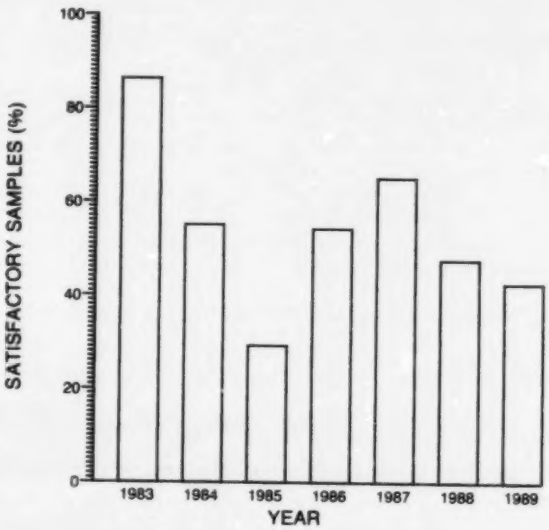
Small batches of wetted seed can be inoculated manually by mixing seed and inoculant in a large container or on a polyethylene sheet. For larger amounts of seed, cement mixers or ice augers can be used for mixing.

Some manufacturers are now combining inoculant and sticker, either in a "double bag" system or with the sticker as a component of the inoculant.

Pre-inoculated Seed

Pre-inoculated alfalfa seed is now available. Problems with inoculant viability have been encountered with this product, but the technology is improving. Pre-inoculated seed should be planted fairly soon after purchase, since the inoculant may suffer drastic loss in viability after just a few weeks of springtime storage conditions. If seeding is delayed by several weeks, seed should be manually re-inoculated. The Agriculture Canada Research Station in Swift Current maintains a regular testing program for all inoculant products.

Performance of Pre-Inoculated Seed Products in Regulatory Tests by Agriculture Canada.



Guide to Successful Inoculation

- Inoculate seed with the correct rhizobium.
- Use a sticker.
- Store inoculant in a cool dry place until use.
- Do not expose to direct sunlight.
- Inoculate seed just before seeding.
- Do not mix fertilizer with inoculated seed.
- Sow inoculated seed in a moist seedbed.
- Use more inoculant under adverse conditions.

Annual Crops for Forage

Annuals can provide good forage value and are particularly useful in times of feed or pasture shortage. However, long-term economics suggest the bulk of forage needs should be met with perennials, using annuals only for specialized or shortage situations.

The traditional annual forages and corn, which do well in the warmer parts of the Province, are listed below. Some experimental and minor use annuals are sorghum-sudangrass, millet, and kochia.

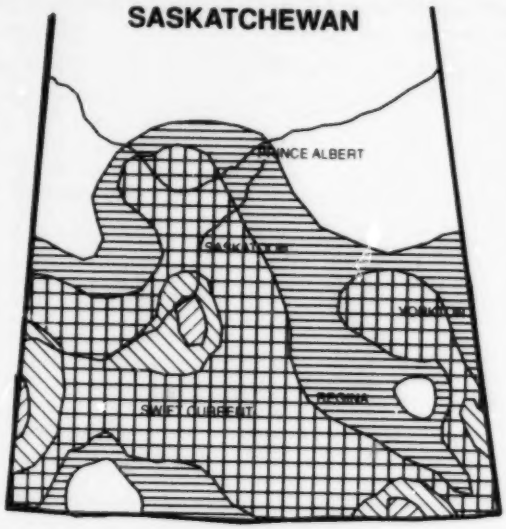
Annuals can be used for pasture, and fit well into complementary grazing systems (see page 13). The choice of crop depends on when the additional pasture is required: fall rye sown in late August to early September will provide early grazing the next spring, and oats, barley or wheat sown in the spring is ready for pasturing about seven weeks after planting. Spring-seeded fall rye or winter wheat will not go to seed, and provides abundant leaf growth for mid and late-season grazing.

High stocking rates (two cow/calf pairs or three steers per acre) plus rotational grazing will ensure good annual pasture productivity.

Annual Crop Varieties

		Soil Zones
Oats	any recommended variety	1,2,3,Irr.
Wheat	any recommended variety	1,2
Fall rye	any recommended variety	1,2,3
Barley	Bonanza or any smooth awn variety	1,2,3,Irr.
Faba beans	any recommended variety	3,Irr.

Average Number of Corn Heat Units Received



Corn for Silage - Recommended Varieties

Variety recommendations are based on climatic heat units. See map above to determine heat unit rating for your area.

Heat Unit Rating	Brand and Hybrid Name	Percentage of Days to Silking	Percentage of Stalk Breakage	Silage Yield Plant Moisture	Tonnes/ha (Dry)
BELOW 2300 Heat Units	Dekalb DK246	90	17.0	63.6	7.6
	PAG SX104	87	15.3	64.6	8.9
	PIONEER 3994	84	15.5	64.9	7.9
	PIONEER 3995	82	34.8	63.8	8.2
	PIONEER 3996	87	8.5	63.8	8.2
ABOVE 2300	Dekalb DK24	92	10.1	66.9	8.7
	Dekalb T778	95	19.9	65.4	8.9
	PAG SX95	91	14.1	64.5	8.7
	PIONEER 3953	92	NA	65.6	9.4
	PIONEER 3969	88	22.5	65.4	9.0

Treat seed with a recommended dual-purpose fungicide.

Fertilizing Forages:

The following are guidelines which may be used to plan fertilizer programs in the absence of a soil test. The suggested rates reflect the long term experience of the Saskatchewan Soil Test Lab. Large variations in fertility can occur between fields, so accurate estimates can only be obtained with a soil test.

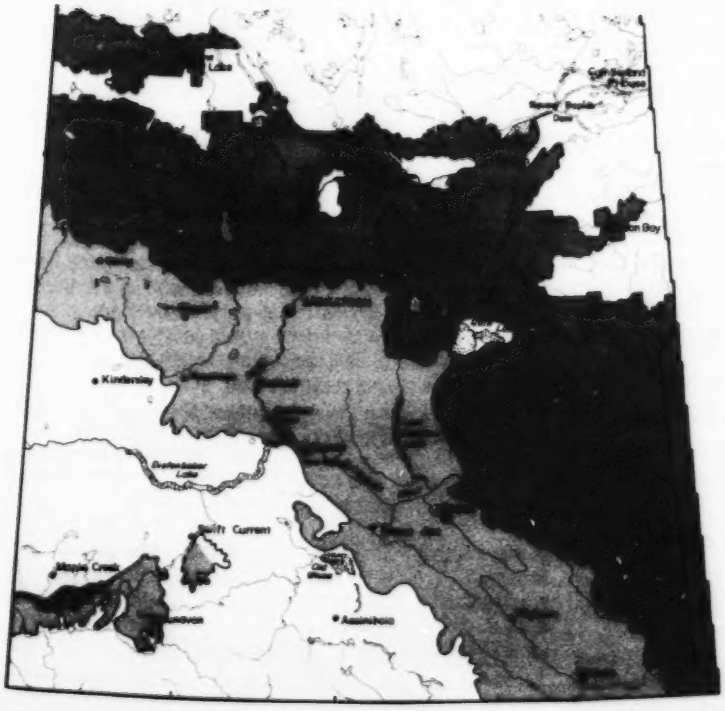
The rates for nitrogen are defined for normal soil moisture conditions.

Phosphorus moves very slowly in soil, so for best results, it should be pre-incorporated.

Rates for potash and sulphur are for coarse textured well-drained soils in the more humid regions of the province. On other soils these nutrients should only be applied on the basis of a valid soil test. Sulphur should be used on Gray Wooded soils, particularly when seeding legumes.

General Fertilizer Recommendations

Crop	Soil Zone	Nitrogen lb/ac(kg/ha) Actual N	Phosphate lb/ac(kg/ha) Actual P_2O_5	Potash lb/ac(kg/ha) Actual K_2O	Sulphur lb/ac(kg/ha) Actual S
Cultivated grasses and Grass - legume mixtures	- Brown and Dark Brown	30-70 (35-80)	0-20 (0-20)		
	- Black and Gray	30-90 (35-100)	0-40 (0-45)	0-35 (0-40)	0-20 (0-20)
	- Irrigation	80-160 (90-175)	0-40 (0-45)		
Legumes	- Brown and Dark Brown	Inoculate	20-30 (20-35)		
	- Black, Gray	Inoculate	30-40 (35-45)	0-35 (0-40)	0-25 (0-30)
	- Irrigation (all zones)	Inoculate	40-60 (45-65)		



Forage Crop - Soil Zones of Saskatchewan

1. Brown
2. Dark Brown
3. Black - Gray-Wooded

Methods of Fertilizer Application and Placement

Nitrogen N	Phosphorus P_2O_5	Potash K_2O	Sulphur S
GRASSES **New Seeding:** Broadcast and incorporate or deep band prior to seeding. Inoculate legume seed. **Established Stands:** Broadcast ammonium nitrate (34-0-0) in fall or spring. Urea (46-0-0) and ammonium sulphate (21-0-0) last week in Oct. or very early spring. Adding N may reduce proportion of legume in stand.	**New Seeding:** If seed row spacing is 6 in. (15 cm) up to 15 lb/ac (15 kg/ha) may be seed placed. At higher rates, broadcast and incorporate or deep band or sideband. Sidebanding is best if row spacing is 30 cm (12 in) or more. **Established stands:** Broadcast in fall or early spring for pasture or hay. Broadcast after harvest for seed production.	**New Seeding:** Broadcast and incorporate or sideband. **Established Stands:** Broadcast at same time as nitrogen.	**New Seeding:** Broadcast and incorporate, deep band, or sideband. **Established Stands:** Broadcast at same time as nitrogen.
LEGUMES **New Seeding:** Inoculate seed. If recommended by soil test, broadcast and incorporate deep band, or sideband a small amount of N.	**New Seeding:** Up to 15 lb/ac (15 kg /ha) may be seed placed. For higher rates, broadcast and incorporate or deep band prior to seeding or sideband. **Established Stands:** Broadcasting P in fall or early spring improves alfalfa yield and longevity.	**New Seeding:** Sideband or broadcast and incorporate. **Established Stands:** Broadcast at same time as phosphorus.	**New Seeding:** Sideband, broadcast or deep band. **Established Stands:** Broadcast at same time as phosphorus.

For more complete information about fertilizers and fertilization practices see the bulletin, "General Recommendations for Fertilization in Sask."

Source of Nitrogen

Established grass stands should be fertilized with granular fertilizers. Experiments have shown granular fertilizers are the most effective nitrogen sources for grasses. Spraying nitrogen solutions, particularly those containing urea, on forage is unsatisfactory and not recommended. Response to nitrogen fertilizers depends upon time of application, amount applied, type of nitrogen fertilizer, age of stand, species of grass, number of cuts taken and climatic conditions. In Saskatchewan urea (and dry fertilizers containing urea) is usually less effective than ammonium nitrate. The relative effectiveness of the various fertilizers when broadcast urea is given a value of 100 are:

	Relative Value
Ammonium nitrate broadcast	110 - 120
Urea broadcast	100

Time of Application

Grass for Hay or Pasture. Grass for hay and pasture should be fertilized in early spring (as soon as fields are sufficiently dry in April or early May), or late fall. Fertilizer should not be applied to frozen soils that are subject to water run-off. The average relative values of time of application when early spring broadcast nitrogen is given a value of 100 are:

Time	Relative Value
Spring	100
Fall	80

Split application of nitrogen during the growing season as compared to a single large application in early spring results in more efficient use of the applied nitrogen. Splitting a fertilizer application will not increase forage yields above single application levels, but the forage protein content is improved with split application. Split applications of less than 45 lb N/ac (50 kg/ha) total are not recommended.

Grass for Seed Production. Timing of nitrogen fertilizer application for grass-seed production is very important and varies with species. The time of application of nitrogen fertilizer for various grass species is as follows:

Meadow Fescue	October or April
Timothy	October or April
Bromegrass	Right after harvest
Russian Wild Ryegrass	Right after harvest
Wheat grasses	Right after harvest

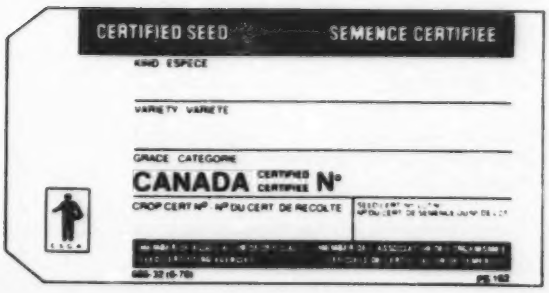
Herbicides for use in forage crops (Recommended for 1990 only)

For more information on herbicides see "Chemical weed control in cereal, oilseed, pulse and forage crops"

Herbicide	Seedling Grass											Seedling Legume						Est. Grass			Established Legume					Cover Crop			
Consult the label for final detailed instructions	Bromegrass	Creeping Red Fescue	Crested Wheatgrass	Inter. Wheatgrass	Kentucky Bluegrass	Meadow Fescue	Orchardgrass	Reed Canarygrass	Russian Wild Ryegrass	Slender Wheatgrass	Timothy	Alfalfa	Alsike Clover	Red Clover	Sainfoin	Sweetclover	White Clover	Grasses	Bromegrass	Russian Wild Ryegrass	Alfalfa	Alsike Clover	Birdsfoot Trefoil	Red Clover	Sweetclover	Barley	Flax	Oats	Wheat
Avadex BW												X[2]	X[2]	X[2]		X[2]	X[2]									X	X		X
Avenge	X[2]	X[2]	X[2]		X[2]	X[2]	X[2]	X[2]	X[2]		X[2]	X[2]		X[2]		X[2]										X			X[3]
Buctril-M	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]															X	X	X	X
Colbutox Embutox Butynic 400												X	X	X			X				X					X		X	X
Eptam 8E												X																	
Fusilade												X[9]		X[9]							X[9]		X[9]	X[9]					
Hoe-Grass	X[5]	X[5]	X[5]	X[5]					X[5]			X[5]	X[5]	X[5]		X[5]										X	X		X
Kerb 50W																		X[8]	X[8]	X[8]	X[8]		X[8]						
Mataven/Mataven L	X[4]	X[4]	X[4]	X[4]		X[4]			X[4]			X[4]		X[4]															X
MCPA	X	X	X	X					X									X	X	X						X	X	X	X
Pardner	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]															X		X	X
Princep Nine-T																					X[5]		X[5]						
Rival																X													
Simazine 80w																					X[5]		X[5]						
Sinbar																					X[5]		X[5]						
Treflan												X			X	X													
Tropotox Plus													X	X			X									X		X	X
2,4-D	X[7]	X[7]	X[7]	X[7]					X[7]									X[7]	X[7]	X[7]						X			X

X- Product is recommended for the crop

1. For seed production only.
2. Do not graze or feed during the year of establishment. Use only when forage seedlings are underseeded in crops for which herbicide is registered.
3. Neepawa, Glenlea, Chester, Selkirk, Macoun, Canuck, Benito, Columbus, Leader, Katepwa, HY320.
4. For seed production only, only in year of establishment.
5. Use in year of establishment only. Do not use forage for feed.
6. Pure stand only. Low rates of Kerb 50W may be used on mixed stands.
7. Use 2,4-D amine only.
8. For forage use only.
9. Do not feed or harvest for forage during the year of treatment.



Crop Certificate Number
The first two digits represent the year in which the crop was produced.
The third to the ninth digits inclusive represent the identification number of the grower who produced the seed.
The tenth digit represents the code for the generation or class issued to the crop which produced the seed.
The eleventh digit represents the number of different certificates of the same status issued to the grower.

Seed Certificate Number
This number is assigned by Agriculture Canada for each lot of seed tagged by a Seed Inspector. There is a different number for each lot of seed.

Seeding Forages in Saline Areas

Saline patches that appear in grain fields may steadily enlarge if annual cropping continues. Converting this land to forages is much more successful if done while the affected land still supports barley crop production.

Late fall seeding of saline areas is desirable, since early spring snowmelt temporarily decreases salinity concentrations.

Seeding mixtures of two, three or even four varieties of grasses and legumes is recommended. Non-saline tolerant species (alfalfa, crested wheatgrass) should be included in salinity mixtures so they can establish around seep edges and in pockets of better soil.

Nearby water recharge areas should be identified and seeded to taprooted alfalfa.

Perennial Forage Crops for Saline Soils, Flooded Areas and Peat (6 inch row spacings)

Salinity Rating *	Crop or Mixture	Approximate Seeding Rate for Hay or Pasture lb/acre or kg/ha
	Soils with Minor Spring Flooding (up to 2 Weeks)	
Slight to Moderate (2-6 mmhos.)	Bromegrass + Russian wild ryegrass + alfalfa (creeping rooted)	4+4+4
	Bromegrass + slender wheatgrass + alfalfa (creeping rooted)	4+4+4
	Russian wild ryegrass + alfalfa	6+3
	Altai wild ryegrass + alfalfa	10+3
	Crested wheatgrass + alfalfa	7+3
	Altai wild ryegrass	11
	Slender wheatgrass + sweetclover (Short-term stands and not over 1 week flooding)	8+6
Severe (6-15 mmhos.)	Bromegrass + Russian wild ryegrass + slender wheatgrass	4+4+4
	Crested wheatgrass + Altai wild ryegrass + tall wheatgrass + alfalfa	4+4+4+2
	Altai wild ryegrass + alfalfa	10+3
	Tall wheatgrass (moist districts or seepage areas)	12
	Spring Flooded (2-5 Weeks)	
Little or none (up to 2 mmhos.)	Reed canarygrass + bromegrass	4+6
	Reed canarygrass + timothy	4+4
	Timothy + bromegrass	4+6
	Altai wild ryegrass + alfalfa (2-3 weeks maximum flooding)	10+3
	Altai wild ryegrass	11
	Timothy + alsike	5 + 2
Slight to moderate (2-6 mmhos.)	Reed canarygrass + bromegrass	4+6
	Reed canarygrass + bromegrass + slender wheatgrass	4+6+6
	Altai wild ryegrass + alfalfa	10+3
	Altai wild ryegrass	11
Severe (6-15 mmhos.)	Altai wild ryegrass + alfalfa	10+3
	Slender wheatgrass	8
	Altai wild ryegrass	11
	Tall wheatgrass	12
	Spring Flooded (5-8 Weeks)	
Little or none (up to 2 mmhos.)	Reed canarygrass	5
	Reed canarygrass + timothy + slender wheatgrass	3+3+6
Slight to moderate (2-6 mmhos.)	Reed canarygrass + slender wheatgrass	4+6
	Tall wheatgrass	12
	Peat, Poorly Drained Soils	
	Timothy + alsike clover	5+2
	Timothy + bromegrass + slender wheatgrass + alsike	3+5+5+2
	Timothy + bromegrass + alsike	3+6+2
	Reed canarygrass + timothy	4+3

*Ratings for salt content in millimhos per centimeter conductivity. Salt content reading can only be determined by obtaining a soil test from the Saskatchewan Soil Testing lab in Saskatoon.

Complementary Grazing: More Pasture for More Months

Forage species differ greatly in total production and periods of peak growth, as shown in the table below.

Native prairie grasses grow slowly in the spring and are relatively low yielders. They give the best yields when grazing is deferred until mid-June or later. Native pasture is damaged by grazing too early.

Crested wheatgrass starts growth early in spring and grows very rapidly in May and June. Bromegrass and alfalfa growth is greatest in June and July. Russian wild ryegrass and Altai wild ryegrass have a long period of growth, starting in early spring and continuing to late fall. These two grasses maintain good palatability and nutrient value through the summer and into late fall.

A carryover of 45% of an average season's total growth is recommended to maintain productive native pasture.

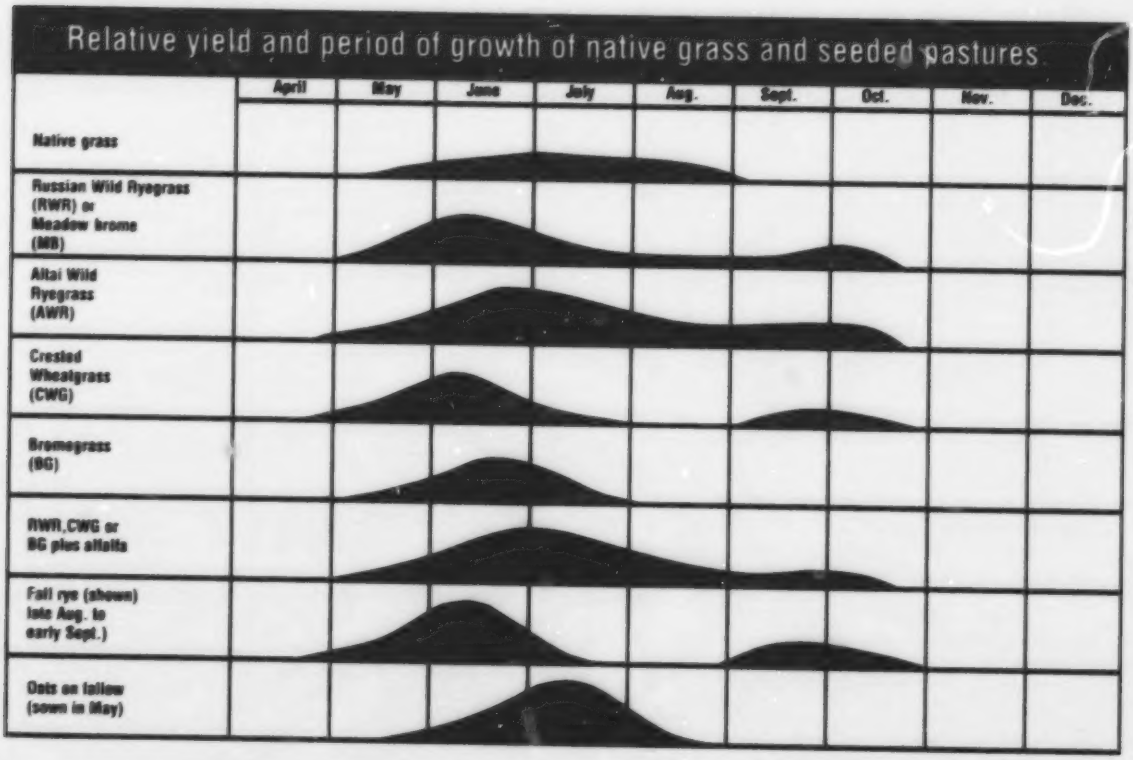
However, cultivated forages can be grazed more severely. Crested wheatgrass, for example, can be grazed down to 30% carryover without adversely affecting production.

Complementary grazing then, is the use of two or more pasture types in a sequence based on growth periods of the dominant species in each pasture. Starting from a base of continuous grazing on native pasture, various complementary improvements can be introduced:

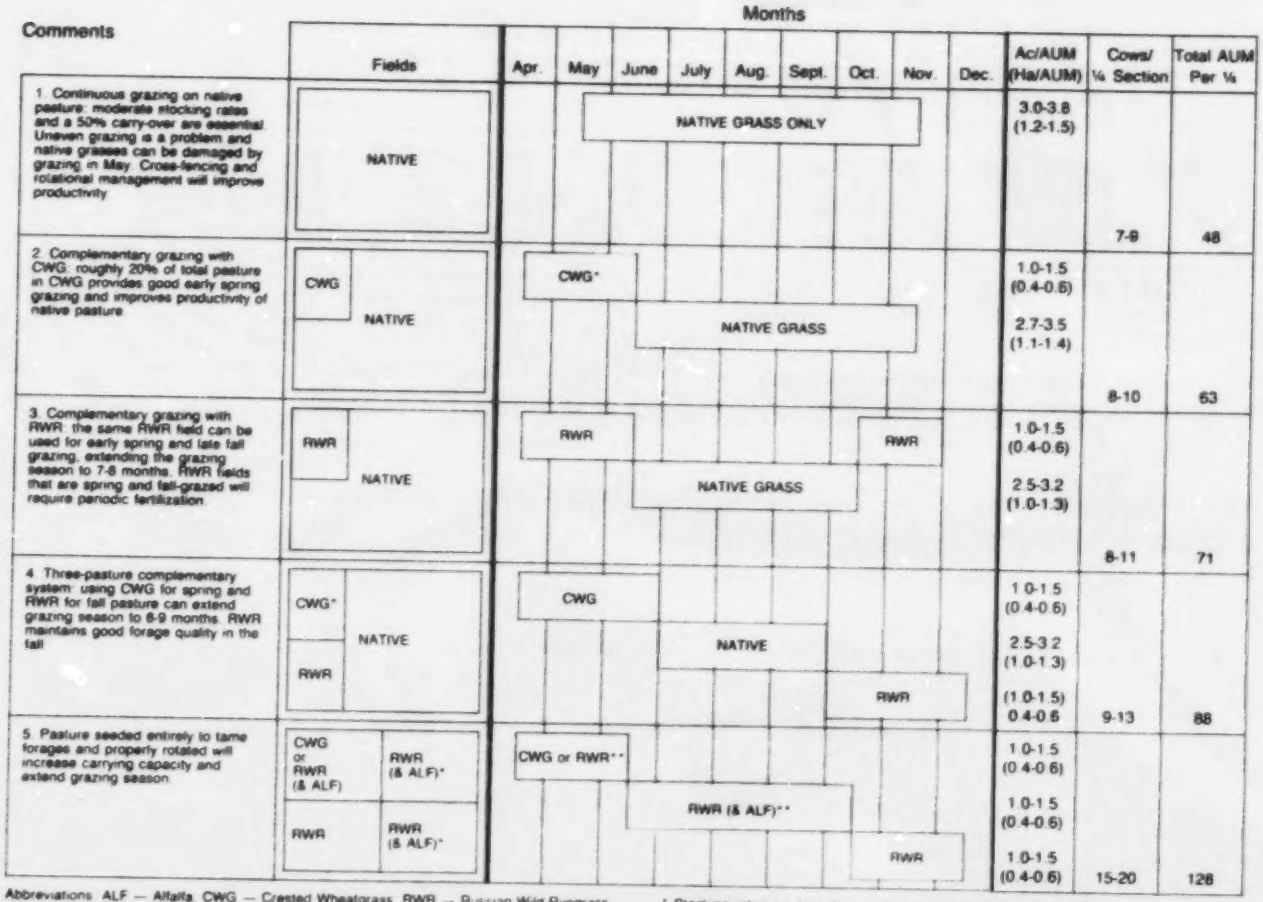
- provide sufficient spring grazing on cultivated (annual or perennial) forage to defer grazing of native pasture until July 15.
- establish Russian or Altai wild ryegrass pastures to lengthen fall grazing season.
- add annuals for summer pasture (see pg. 8).
- cross-fence pastures to develop a rotational (deferred, short-duration, Savory, etc.) grazing system based on complementary use of pasture types available.

Some examples of grazing systems are shown on pages 14 and 15. Producers should be aware that higher levels of management are required for complementary grazing systems.

Relative yield and period of growth of native grass and seeded pastures



Complementary Pasture Systems for Brown & Dark Brown Soil Zones



Abbreviations: ALF — Alfalfa, CWG — Crested Wheatgrass, RWR — Russian Wild Ryegrass, AUM — Animal Unit Month

* Stocking rates are based on pasture in good condition.
** The addition of alfalfa to a spring or summer pasture can increase carrying capacity a further 20 to 50%.

The Animal Unit Month (AUM) Concept

The AUM concept is very useful for planning grazing strategies. One AUM is defined as one 1000 lb cow (with calf at foot) grazing for one month. Thus a quarter section that is rated at 48 AUM can carry 8 cows for 6 months. Alternately, the pasture can carry 12 cows for 4 months, or any other combination that works out to 48 AUM.

Livestock are rated the following way:

1 1000 lb cow (w/calf)	1.0 AUM
1 yearling steer or heifer	.65-.75
1 bull	1.5
1 horse	1.5
5 ewes (w or w/o lambs)	1.0

For larger cows, AUM value is adjusted upward (example: cows averaging 1200 lbs would equal 1.2 AUM).

Complementary Pasture Systems for the Black & Gray Wooded Soil Zones

Comments	Fields	Months: Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ac/AUM (Ha/AUM)	Cows/ ¼ Section	Total AUM per ¼
1. Grazing bush pastures before mid-June will reduce long-term carrying capacity.	BUSH PASTURE			BUSH PASTURE							6.4-15.8 (2.6-6.4)	10-25	60
2. Seeding about 20% of the area to CWG or other spring forage and fencing for rotational grazing control will extend grazing season. CWG fields that are spring and fall-grazed will require periodic fertilization.	CWG / BUSH PASTURE		CWG**		BUSH PASTURE		CWG				2-2.7 (0.8-1.1) 5.2-10.6 (2.1-4.3)	12-22	85
3. Rejuvenating 20% of old stands and rotating stock will increase carrying capacity and extend grazing season.	CWG / DEPLETED TAME PASTURE		CWG**		DEPLETED TAME PASTURE		CWG				2-2.7 (0.8-1.1) 4-5.4 (1.6-2.2)	18-26	110
4. Rotational grazing and tame forages such as these will probably be the most economical of all grazing methods.	CWG & ALF / MB & ALF / MB & ALF / CWG & ALF		CWG & ALF***		MB & ALF		CWG & ALF				2-2.7 (0.8-1.1) 2.3-3.2 (.9-1.3) 2-2.7 (0.8-1.1)	26-36	150

Abbreviations: ALF - Alfalfa, CWG - Crested Wheatgrass, MB - Meadow Bromegrass, AUM - Animal Unit Month

* Stocking rates based on pasture in good condition.
** Note actual time to start grazing in the spring should be based on forage height 10-15 cm (4-6 in) rather than any specific date.
*** The addition of alfalfa to a spring or summer pasture can increase carrying capacity a further 20 to 50%.

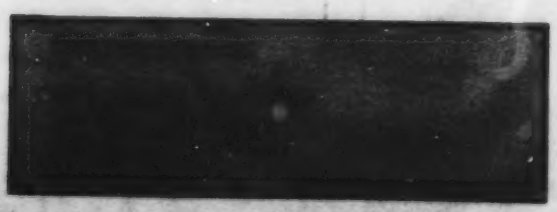
Bloat

Bloat is a potentially lethal expansion of the stomach in ruminant animals, which can occur after they have eaten large quantities of legume forage. Legumes can create a stable foam in the rumen, which blocks the normal escape of gas.

Fear of bloat causes many producers to avoid use of forage legumes; however, most of the specific situations that cause bloat can be avoided.

- Do not turn livestock directly on to a lush, vigorously-growing legume field. Make sure the animals are already fed when they go on, and avoid putting them on in the morning, when dew increases plant moisture content.
- Seed pastures to a mixture of grasses and legumes, to reduce legume intake.
- In high-risk situations, feed bloat control products containing poloxalene.
- Consider use of non bloating legumes (sainfoin) or low-growing types (certain clovers, cicer milkvetch).

Certain breeds and strains of livestock seem to be prone to bloat. Bloated animals can be saved if prompt action is taken, in consultation with a veterinarian.



Nitrate Poisoning

Frosted green oats can cause nitrate poisoning, as well as barley, wheat, corn, flax, sorghum and other forages and certain weeds (lamb's quarters, kochia and Russian thistle).

Plants take up nitrogen largely in the form of nitrate. Under favorable growing conditions, the plant quickly converts nitrate to non-toxic compounds. Poor growing conditions (drought or frost) can cause nitrate to accumulate. When conditions improve and the plant starts growing again, nitrates are quickly used up.

When livestock consume forage containing nitrate, their ability to absorb oxygen is reduced. Symptoms of mild nitrate poisoning include restlessness, frequent passing of urination and watery eyes. Acute poisoning causes extreme weakness, blue coloration of eyes and mouth, shortness of breath, and finally death. Nitrate poisoning can be treated by prompt injection (by a veterinarian) of aqueous methylene blue.

Nitrate poisoning can be avoided by taking these precautions. Feed animals first before turning them out on lush annual pasture or cereal aftermath. Check herd frequently during initial period and consider supplementary feeding. Have stored hay (especially frozen cereal forage) analyzed by the Feed Test Laboratory. (It is a good management practice to have all forages analyzed).

Comparative Seed Size of Most Forage Crops

Crop	Approx. No. of Seeds/kg	Approx. No. of Seeds/lb.
LEGUMES		
Alfalfa	440,000	200,000
Sweetclover	572,000	260,000
Alsike clover	1,540,000	700,000
Red clover	605,000	275,000
White clover	1,760,000	800,000
Bird's-foot trefoil	825,000	375,000
Sainfoin	66,000	30,000
Cicer milkvetch	286,000	130,000
GRASSES		
Russian wild ryegrass	385,000	175,000
Altai wild ryegrass	112,000	51,000
Crested wheatgrass	385,000	175,000
Northern wheatgrass	340,000	155,000
Western wheatgrass	242,000	110,000
Intermediate wheatgrass	194,000	88,000
Pubescent wheatgrass	220,000	100,000
Slender wheatgrass	350,000	160,000
Streambank wheatgrass	344,000	156,000
Tall wheatgrass	174,000	79,000
Kentucky bluegrass	4,800,000	2,182,000
Smooth bromegrass	300,000	136,000
Meadow bromegrass	176,000	80,000
Creeping red fescue	1,353,000	615,000
Meadow fescue	506,000	230,000
Tall fescue	500,000	227,000
Meadow foxtail	1,270,000	577,000
Creeping foxtail	1,657,000	753,000
Orchardgrass	1,439,000	654,000
Timothy	2,710,000	1,232,000
Reed canarygrass	1,175,000	534,000

Calculating Seeding Rates

For individualized seeding rates, the following information can be used. Optimal seeding density ranges from 20 seeds per square foot in dry areas (brown soils) to 45 seeds per square foot in moist areas (Parkland) or irrigated land.

Sample Calculation: straight alfalfa in high moisture area:

45 seeds/ft² X 43,560 ft² = 1,960,200 seeds/acre

alfalfa contains 200,000 seeds/pound (see table)

1,960,200/200,000 = 10 lbs. alfalfa per acre

Other forages can be calculated on the same basis. For mixtures, the same guideline can be used, i.e., the sum of all the seeds in the mix should work out to 20 to 45 seeds per square foot, depending on moisture.

Row spacing generally ranges from 24 inches in the driest soils to 6 inches in high moisture/irrigated situations. Wide row spacings encourage flowering in grasses and legumes, so spacings for seed production are usually wider than for forage production.

Optimal seeding rates may be varied somewhat based on seed quality and cost, seeding conditions and end use of the crop.

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Revised in 1990 by D. Gayton, Forage and Range Management Specialist, in consultation with the Saskatchewan Advisory Council on Forage Crops of The Saskatchewan Agricultural Services Coordinating Committee.

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